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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/744,877	01/29/2001	Aomar Halimaoui	5310-03000	8711

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Eric B Meyertons
Conley Rose & Tayon
PO Box 398
Austin, TX 78767-0398

EXAMINER

NOVACEK, CHRISTY L

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 02/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/744,877

Applicant(s)

HALIMA OUI ET AL.

Examiner

Christy L. Novacek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-55 is/are pending in the application.
- 4a) Of the above claim(s) 37-55 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the request for continued examination filed November 15, 2002, the amendment filed November 15, 2002 and the supplemental amendment filed December 13, 2002.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on November 15, 2002 and December 13, 2002 have been entered.

Election/Restrictions

Newly submitted claims 37-55 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The originally presented claims, as well as claims 18-36 are drawn to a method of making a semiconductor device, class 438, while newly submitted claims 37-55 are drawn to a semiconductor device, class 257. The product (semiconductor device) of the newly submitted claims 37-55 can be made by another and materially different process than that recited in claims 1-36. For example, the semiconductor device of claims 37-55 can be made by depositing two silicon oxide layers of different thicknesses by a CVD process, implanting the substrate with Si, Ge, Ar, Ne or He ions, and then forming transistors on the silicon oxide layers.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 37-55 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Chittipeddi (US 5,918,116).

Regarding claim 18, Chittipeddi discloses implanting predetermined regions of a silicon substrate (10) with Si ions (18) at an implantation energy of 5-500 keV (Fig. 5; col. 2, ln. 48-54; col. 3, ln. 19-37). The surface of the silicon substrate is oxidized to form a gate oxide layer (22) of non-uniform thickness and MOS transistors are formed at the predetermined regions of the substrate such that the oxidized layer at the predetermined regions forms the gate oxide layer of the MOS transistors (Fig. 7; col. 3, ln. 66-col. 4, ln. 26; col. 3, ln. 45-58).

Regarding claim 19, as discussed above, Chittipeddi discloses that the implanting in predetermined regions is an ion implantation step (col. 3, ln. 19-25).

Regarding claim 20, the implanted dose is from 1×10^{12} to about 5×10^{16} ions/cm² (col. 3, ln. 34-37).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chittipeddi (US 5,918,116) in view of Tzeng (US 5,215,934, previously cited).

Regarding claims 21 and 22, Chittipeddi discloses that the gate oxide layer can be grown by “any suitable technique”, which may include heating the substrate to a temperature of 600-1200°C and subjecting the substrate to a wet or dry O₂ atmosphere (col. 3, ln. 67-col. 4, ln. 6). Chittipeddi does not specifically disclose that this oxidation is done within a “furnace”. Like Chittipeddi, Tzeng discloses a method of thermally oxidizing a silicon substrate that has been implanted with oxidation-rate-enhancing ions (Abstract). Tzeng discloses that this oxidation step may be successfully accomplished by thermally oxidizing the substrate at a temperature of about 950°C for approximately 10 minutes in a dry oxygen atmosphere within a furnace (col. 6, ln. 9-15). At the time of the invention, it would have been obvious to one of ordinary skill in the art to conduct the oxidation process of Chittipeddi within a furnace as taught by Tzeng because both Chittipeddi and Tzeng are conducting the same type of oxidation process.

Claims 23-25, 28-30, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chittipeddi (US 5,918,116) in view of Bergeron et al. (US 4,157,268, previously cited).

Regarding claims 23-25, 28-30, 33 and 34, Chittipeddi discloses implanting predetermined regions of a silicon substrate (10) with a dose of 1×10^{12} to about 5×10^{16} ions/cm² ions (18) at an implantation energy of 5-500 keV with an implanted dose of (Fig. 5; col. 2, ln. 48-54; col. 3, ln. 19-37). The surface of the silicon substrate is oxidized to form a gate oxide layer (22) of non-uniform thickness and MOS transistors are formed at the predetermined regions of the substrate such that the oxidized layer at the predetermined regions forms the gate oxide layer of the MOS transistors (Fig. 7; col. 3, ln. 66-col. 4, ln. 26; col. 3, ln. 45-58). Chittipeddi discloses that the ions (18) are "selected for their ability to amorphize the epitaxial silicon layer 10 [substrate]" and, "[S]uch ions include silicon, fluorine, arsenic, and mixtures thereof" (col. 3, ln. Chittipeddi does not disclose using ions of Ar, Ne or He. Like Chittipeddi, Bergeron discloses a method of implanting ions (18) into a silicon substrate (10) in order to damage the crystalline structure of the substrate and then subjecting the substrate to an oxidation process in order to oxidize the damaged substrate regions (col. 3, ln. 39-50). Bergeron discloses that the ions used to damage/amorphize the substrate may be silicon, helium, neon or argon (col. 3, ln. 42-43). At the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute any one of helium, neon or argon ions for the silicon ions disclosed by Chittipeddi as a matter of design choice because Chittipeddi discloses that ions are chosen only for their ability to amorphize the silicon substrate and Bergeron teaches that any of these ions (He, Ne, Ar or Si) may be used for that purpose.

Claims 26, 27, 31, 32, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chittipeddi (US 5,918,116) in view of Bergeron et al. (US 4,157,268) as applied to claims 23, 28 and 33 above, and further in view of Tzeng (US 5,215,934).

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Regarding claims 26, 27, 31, 32, 35 and 36, Chittipeddi discloses that the gate oxide layer can be grown by “any suitable technique”, which may include heating the substrate to a temperature of 600-1200°C and subjecting the substrate to a wet or dry O₂ atmosphere (col. 3, ln. 67-col. 4, ln. 6). Chittipeddi does not specifically disclose that this oxidation is done within a “furnace”. Like Chittipeddi, Tzeng discloses a method of thermally oxidizing a silicon substrate that has been implanted with oxidation-rate-enhancing ions (Abstract). Tzeng discloses that this oxidation step may be successfully accomplished by thermally oxidizing the substrate at a temperature of about 950°C for approximately 10 minutes in a dry oxygen atmosphere within a furnace (col. 6, ln. 9-15). At the time of the invention, it would have been obvious to one of ordinary skill in the art to conduct the oxidation process of Chittipeddi within a furnace as taught by Tzeng because both Chittipeddi and Tzeng are conducting the same type of oxidation process.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (703) 308-5840. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

CLN

February 13, 2003



AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800